

IN THE CLAIMS:

Please AMEND the claims as indicated below:

1. (CURRENTLY AMENDED) An optical switch expanding method for increasing the number of inputs and outputs of an optical switch comprising first to fourth optical matrix switches, each of the first to fourth optical matrix switches including wherein a plurality of 2-input/2-output optical switch elements ~~are~~ arranged in a matrix to form a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports, and a plurality of auxiliary output ports, comprising:

respectively connecting said auxiliary output ports in the first optical matrix switch to said input ports in the third optical matrix switch;

respectively connecting said output ports in the second optical matrix switch to said auxiliary input ports in the third optical matrix switch;

respectively connecting said output ports in the first optical matrix switch to said auxiliary input ports in the fourth optical matrix switch; and

respectively connecting said auxiliary output ports in the second optical matrix switch to said input ports in the fourth optical matrix switch, the first, second, third and fourth optical matrix switches together thereby being a non-blocking optical switch.

2. (CURRENTLY AMENDED) An optical switch comprising first to fourth optical matrix switches, each of the first to fourth optical matrix switches including wherein a plurality of 2-input/2-output optical switch elements ~~are~~ arranged in a matrix to form a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports, and a plurality of auxiliary output ports, and wherein:

said auxiliary output ports in the first optical matrix switch are respectively connected to said input ports in the third optical matrix switch;

said output ports in the second optical matrix switch are respectively connected to said auxiliary input ports in the third optical matrix switch;

said output ports in the first optical matrix switch are respectively connected to said auxiliary input ports in the fourth optical matrix switch; and

said auxiliary output ports in the second optical matrix switch are respectively connected to said input ports in the fourth optical matrix switch, the first, second, third and fourth optical matrix switches together thereby being a non-blocking optical switch.

3. (ORIGINAL) The optical switch according to claim 2, wherein the first to fourth optical matrix switches are Cross-bar optical matrix switches.

4. (ORIGINAL) The optical switch according to claim 2, wherein said 2-input/2-output optical switch elements are semiconductor optical switches.

5. (ORIGINAL) The optical switch according to claim 2, wherein said 2-input/2-output optical switch elements are optical switches in an opto-micro-electromechanical system.

6. (ORIGINAL) The optical switch according to claim 2, wherein the first to fourth optical matrix switches are PI-LOSS optical matrix switches.

7. (CURRENTLY AMENDED) An optical crossconnecting apparatus comprising:
a plurality of optical demultiplexing means for demultiplexing, on a wavelength basis, input light so as to be output from a plurality of output ports;

a plurality of optical multiplexing means for wavelength-multiplexing light which have been input to a plurality of input ports; and

a non-blocking optical switch comprising

first to fourth optical matrix switches, each of the first to fourth optical matrix switches comprising ~~wherein~~ a plurality of 2-input/2-output optical switch elements are arranged in a matrix to form a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports, and a plurality of auxiliary output ports, wherein

said auxiliary output ports in the first optical matrix switch are respectively connected to said input ports in the third optical matrix switch,

said output ports in the second optical matrix switch are respectively connected to said auxiliary input ports in the third optical matrix switch,

said output ports in the first optical matrix switch are respectively connected to said auxiliary input ports in the fourth optical matrix switch,

said auxiliary output ports in the second optical matrix switch are respectively connected to said input ports in the fourth optical matrix switch,

said input ports in said optical switches are connected to a plurality of output ports in said optical demultiplexing means, and

said output ports in said optical switches are connected to a plurality of

input ports in said optical multiplexing means.

8. (CURRENTLY AMENDED) An optical cross-connecting apparatus comprising:
- a plurality of optical demultiplexing units to demultiplex, on a wavelength basis, input light to be output from a plurality of output ports;
 - a plurality of optical multiplexing units to wavelength-multiplex light input to a plurality of input ports; and
 - a non-blocking optical switch comprising:
 - first to fourth optical matrix switches, ~~wherein each of the first to fourth optical matrix switches comprising~~ a plurality of 2-input/2-output optical switch elements ~~are~~ arranged in a matrix to form a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports, and a plurality of auxiliary output ports, said auxiliary output ports in the first optical matrix switch being respectively connected to said input ports in the third optical matrix switch, said output ports in the second optical matrix switch being respectively connected to said auxiliary input ports in the third optical matrix switch, said output ports in the first optical matrix switch being respectively connected to said auxiliary input ports in the fourth optical matrix switch, said auxiliary output ports in the second optical matrix switch being respectively connected to said input ports in the fourth optical matrix switch, said input ports in said optical switches being connected to a plurality of output ports in said optical demultiplexing units; and said output ports in said optical switches being connected to a plurality of input ports in said optical multiplexing units.

9. (CURRENTLY AMENDED) An optical switch ~~to receive and output at least sixteen signals, comprising:~~

four nxn optical matrix switches, each having at least sixteen 2-input/2-output optical switch elements arranged in a matrix ~~having and providing that two of the four optical matrix switches receive at least sixteen input signals, the four nxn optical matrix switches being connected to form at least four input ports, at least four auxiliary input ports, at least four output ports, and at least four auxiliary output ports, two of the four optical matrix switches together receiving a total of at least sixteen input optical signals, such that each of the at least sixteen input optical signals received passes passing through no more than two of the four nxn optical matrix switches to be provide one of sixteen output signals output by the other two of the four optical matrix switches, the four nxn optical matrix switches together thereby being a non-~~

blocking optical switch.

10. (CURRENTLY AMENDED) An apparatus comprising:

four nxn optical matrix switches each including a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports and a plurality of auxiliary output ports, wherein the input ports, the auxiliary input ports, the output ports and the auxiliary output ports of the four nxn optical matrix switches are connected together so that the four nxn optical matrix switches together provide a 2nx2n non-blocking optical switch configured so that an input signal on any of the input ports is switchable to be output from any of the output ports while passing through no more than two of the four nxn optical matrix switches.

11. (CURRENTLY AMENDED) An apparatus comprising:

four nxn optical matrix switches each including a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports and a plurality of auxiliary output ports; and means for connecting the input ports, the auxiliary input ports, the output ports and the auxiliary output ports so that the four nxn optical matrix switches together provide a 2nx2n non-blocking optical switch configured so that an input light on any of the input ports is switchable to be output from any of the output ports while passing through no more than two of the four nxn optical matrix switches.

12. (CURRENTLY AMENDED) An apparatus comprising:

four 4x4 optical matrix switches each including a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports and a plurality of auxiliary output ports, wherein the input ports, the auxiliary input ports, the output ports, and the auxiliary output ports of the four 4x4 optical matrix switches are connected together to provide so that the four 4x4 optical matrix switches together provide an 8x8 non-blocking optical switch configured so that an input light on any of the input ports is switchable to be output from any of the output ports while passing through no more than two of the four 4x4 optical matrix switches.

13. (CURRENTLY AMENDED) An apparatus comprising:

four 4x4 optical matrix switches each including a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports and a plurality of auxiliary output ports; and means for connecting the input ports, the auxiliary input ports, the output ports and the

auxiliary output ports so that the four 4x4 optical matrix switches together to provide an 8x8 non-blocking optical switch configured so that an input light on any of the input ports is switchable to be output from any of the output ports while passing through no more than two of the four 4x4 optical matrix switches.